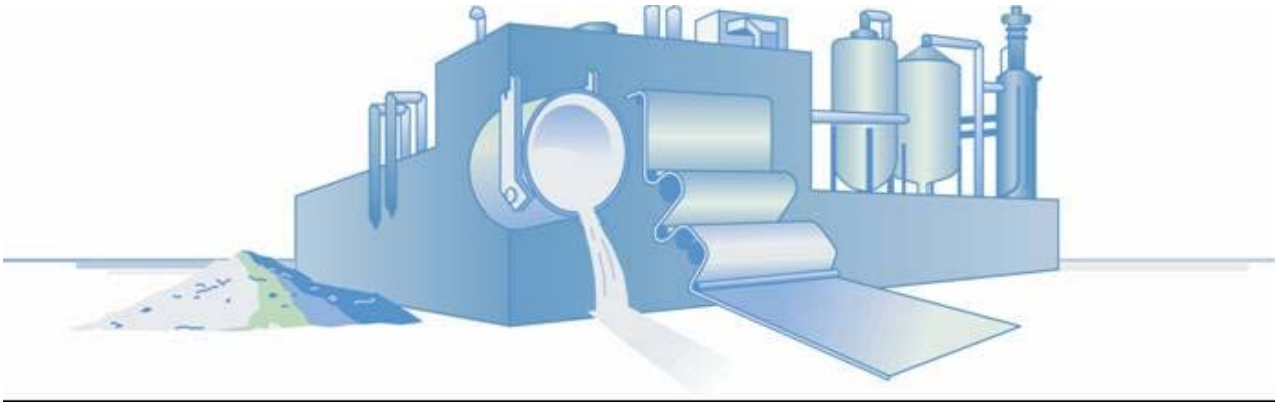
Industrial Technologies Program

Tool Strategy



A Plan to Enhance the Energy Savings Impacts of the ITP Software Tools

U.S. Department of Energy
Energy Efficiency and Renewable Energy

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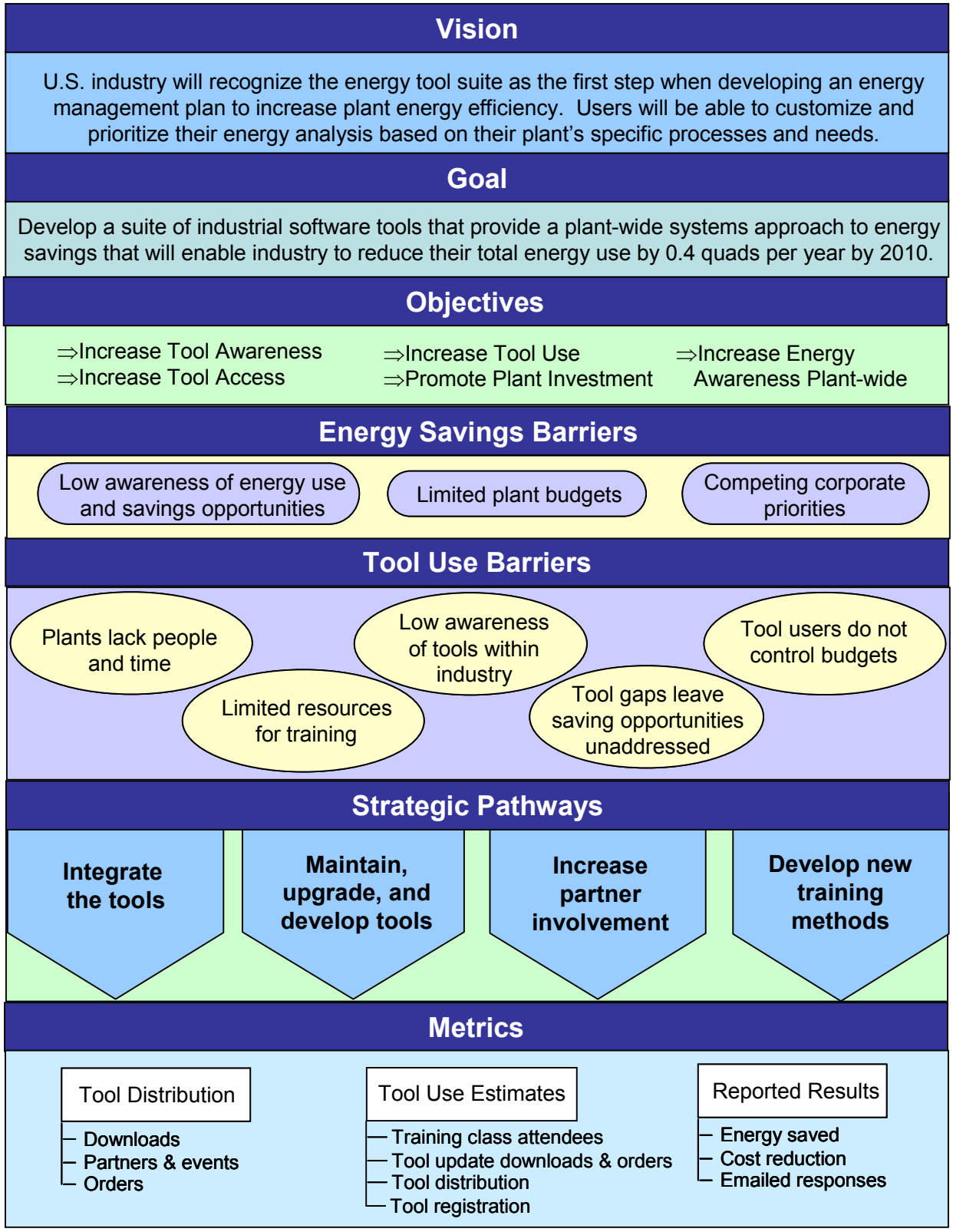
Overview of the Tool Strategy

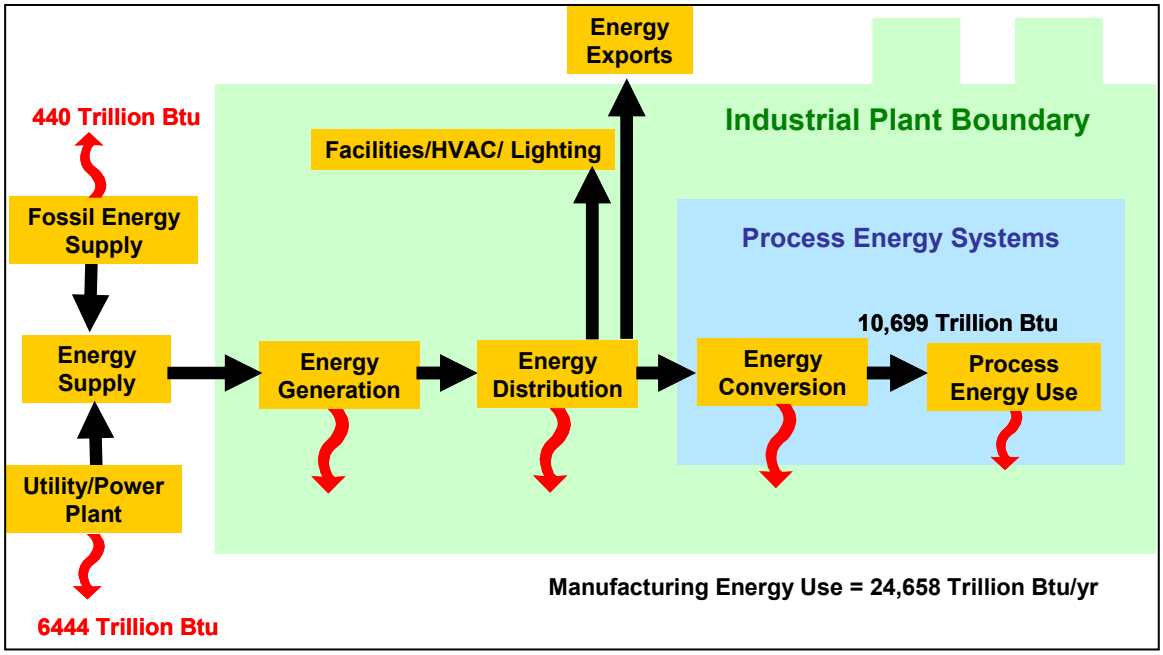


2. Introduction: The Role of Tools in Reducing U.S. Manufacturing Energy Use and Loss

Manufacturing Energy Use and Losses

The U.S. manufacturing sector depends heavily on fuels and power for the conversion of raw materials into usable products. The sector also uses energy as a source of raw materials (feedstock energy) for chemicals and materials. As a result, the efficiency in which energy is used, as well as the cost and availability of energy have a substantial impact on the competitiveness and economic health of U.S. manufacturers. As shown in Exhibit 1, U.S. manufacturers consumed approximately 25 quadrillion British thermal units (Btu) of energy (quads) in 2001 or over one quarter of the 96 quads of energy consumed in the United States. However, before reaching its intended target–plant processes–over 50 percent of that energy is lost in generation, distribution, and conversion.

Exhibit 1: U.S. Manufacturing Energy Use and Losses



More efficient use of fuels and power lowers production costs, conserves limited energy resources, and increases productivity. Efficient use of energy also has positive impacts on the environment–reductions in fuel use translate directly into fewer emissions of criteria pollutants such as sulfur oxides, nitrogen oxides, and particulates, as well as greenhouse gases such as carbon dioxide. Improved efficiency also reduces the use of feedstock energy through greater yields, resulting in more products being manufactured for the same amount of energy. Reducing use of energy feedstocks directly impacts U.S. dependence on imported oil, and alleviates pressure on increasingly scarce natural gas supplies.

Energy Savings Barriers

Energy efficiency varies dramatically across industries and manufacturing processes, and even between plants manufacturing the same products. Efficiency can be limited by mechanical, chemical, or other physical parameters, or by the age and design of equipment. In some cases, operating and maintenance practices contribute to reduced efficiency. Regardless of the reason, less-than-optimum energy efficiency translates directly into lost energy. In the manufacturing sector, these energy losses amount to several quadrillion Btus or billions of dollars in lost revenues every year.

Increasing the efficiency of energy use could result in substantial benefits to both industry and the nation. However, manufacturers face three major challenges to accomplishing this:

Low awareness of energy use and savings opportunities

Plants that lack dedicated energy managers are often unaware of where they use energy, how much they use, and how much it costs them. These plants are often unaware of low-cost, high return-on-investment (ROI) opportunities for reducing energy use and cost.

Limited plant budgets

Commodity prices for chemicals and materials fluctuate based on market supply and demand, often yielding low profit margins and consequently, reduced profit reinvestment into the plants.

Competing corporate priorities

Industrial project paybacks drive corporate investments. Relatively low U.S. energy prices have discouraged investment in energy projects. Plant budgets often go to environmental compliance, maintenance, and other cost reduction investments.

The sheer complexity and number (thousands) of processes used in the manufacturing sector make increasing efficiency a daunting task. There are, however, significant opportunities to address energy efficiency in energy systems that are used across many different industries, such as steam generators, onsite power systems, fired heaters, heat exchangers, compressors, motors, and pumps, among others. The DOE Office of Energy Efficiency and Renewable Energy's (EERE) Industrial Technologies Program (ITP)'s portfolio of software tools focuses on these systems.

Current ITP Tools

Industrial manufacturing plants are often unaware of low-cost, high-ROI (return on investment) projects that could help them recover energy losses and improve their energy efficiency. ITP develops and disseminates software tools to help plants identify energy savings opportunities and improve their energy efficiency. These tools are computer-based analytical models that focus on key plant utility systems, including motors, pumps, compressed air, steam, and process heat. The tools are available from the EERE Information Center of the ITP website.

ITP's Software Tools

- Facilitate assessment & analysis
- Build in-plant expertise
- Generate interest in energy savings

These tools, outlined in Exhibit 2 and 3, provide expertise on generic plant utility systems found throughout industry, helping plants identify and quantify energy savings opportunities and guiding users in the steps needed to achieve these savings. These savings tips include improved operation practices, equipment retrofits, and equipment replacements. The tools identify and assess the opportunities for energy and fuel savings without proposing a product, technical solution, or design change. Each tool was developed independently by a partnership with DOE and industry stakeholders. For select tools, training is available to help end-users apply the tool correctly.

Exhibit 2: Existing ITP Software Tools

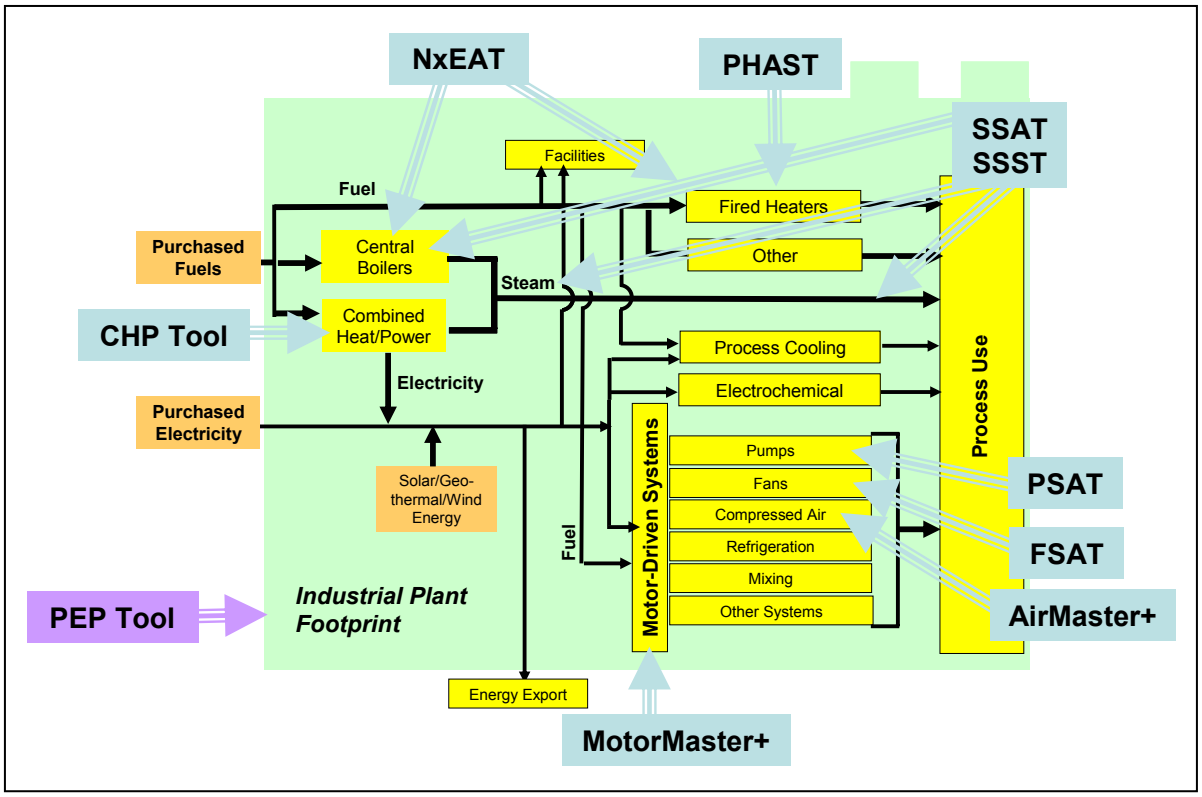
Tool	Description
Steam System Assessment Tool (SSAT)	Estimates the impacts of key steam system improvements. Generates results detailing the energy, cost, and emissions savings that up to 16 different improvements could achieve.
Steam System Scoping Tool (SSST)	Evaluates a facility's steam system operations and management practices against best practices.
Process Heating Assessment and Survey Tool (PHAST)	Surveys process heating equipment and identifies the most energy-intensive equipment. Performs energy (heat) balances on selected equipment (furnaces) to identify and reduce non-productive energy use. Compares performance of the furnace under various operating conditions, and tests "what-if" scenarios.
AIRMaster+	Assesses compressed air systems, models existing and future system upgrades, and evaluates savings and effectiveness of energy-efficiency measures.
MotorMaster+	Identifies inefficient or oversized facility motors, and computes the energy and demand savings associated with selection of an energy-efficient replacement. Includes motor inventory management, maintenance logging, and a price and performance database.
Pumping System Assessment Tool (PSAT)	Helps user identify energy savings opportunities in pumping systems and quantifies those opportunities in both dollars and electrical energy.
NOx and Energy Assessment Tool (NxEAT)	Assesses and analyzes NOx emissions and applications of energy-efficiency improvements at petroleum refining and chemical plants. Inventories emissions from NOx-generating equipment, and compares various technology applications and efficiency measures that affect overall costs and reduction of NOx. Performs "what-if" analyses to optimize and select the most cost-effective methods for reducing NOx.
Fan System Assessment Tool (FSAT)	Assesses the efficiency of fan-system operations. Identifies savings opportunities, analyzes system data to rate efficiency, calculates energy savings, and identifies fan systems not operating at best capacity.
Combined Heating and Power Tool (CHP Tool)	Identifies opportunities for CHP units. Includes a directory of CHP units in today's market and gives cost and payback estimates.

Exhibit 3: ITP Software in Development

Tool	Description
Plant Energy Profiler Tool (PEP Tool)	Assesses plant-wide operating practices against an industry energy-use baseline. Generates energy maps that identify areas of high energy consumption and potential energy savings throughout the plant. Produces a score card that provides guidance and justification for energy savings projects. Makes recommendations for use of energy management tools, such as pump and steam system optimization, to reduce energy consumption.

These tools address the plant systems that generate, distribute, and convert energy (shown in Exhibit 4). To continuously improve the tools program, DOE tracks the distribution and use of tools in these plant systems. In 2002 alone, the use of tools and training resulted in over 50 trillion Btus in energy savings. Expanding the use of existing tools—as well as adding other high-impact tools to the portfolio—has the potential to significantly reduce energy savings in these plants in the near term.

Exhibit 4: ITP Tools Address Plant Systems throughout the Plant



Tool Use Barriers

Despite the value and availability of the software tools, many industrial plants and corporations have not used them for various reasons. ITP has identified six major barriers to more widespread tool use:

Low awareness of tools within industry

Many plants are unaware of the ITP tools available and the potential benefits they can deliver. Current users often use only a single tool and are unaware of other tools able to minimize energy use in other plant utility systems.

Limited resources for training

Most tools require training to maximize effective use; however, ITP has limited resources to train the representatives from the some 225,000 manufacturing plants in the United States.

Tool users do not control budgets

Tool users are typically plant-level personnel who often do not have control of plant budgets. These users must convince the plant's management or corporate office to allow the implementation of the energy savings projects that require investment.

Plants lack people and time

Plant engineers and operators often do not have the time needed to learn to use the tools or even to actually use the tools. Tool use requires time-intensive tasks such as attending training workshops and gathering and inputting the data required by each tool.

Tool gaps leave saving opportunities unaddressed

ITP tool capabilities vary and therefore the tools are more developed in some energy system areas than in others. These underdeveloped areas or energy system gaps limit the user's ability to capture a plant's total energy savings potential.

3. Tool Vision, Goal, and Objectives

Vision and Goal

VISION
U.S. industry will recognize the energy tool suite as the first step when developing an energy management plan to increase plant energy efficiency. Users will be able to customize and prioritize their energy analysis based on their plant's specific processes and needs.

The EERE mission is to reduce the nation's reliance on foreign energy sources, reduce environmental impacts, increase the use of renewable energy sources, improve competitiveness, and improve the quality of life for Americans. ITP supports this mission by developing and maintaining a software tool suite to help the industrial manufacturing sector conserve energy.

GOAL
Develop a suite of industrial software tools that provide a plant-wide systems approach to energy savings that will enable industry to reduce their total energy use by 0.4 quads per year by 2010.

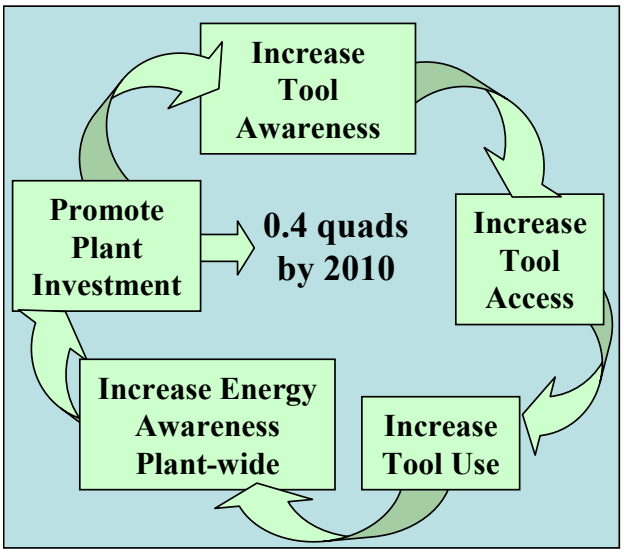
Further development of the tool suite will focus on providing a plant-wide systems approach to energy savings to enable users to reduce energy use throughout the plant. The Tool Vision seeks to make U.S. industry recognize the DOE tool suite as the first step to formalizing plant energy management and increasing plant energy efficiency. The flexibility of the multi-part tool suite will allow users to customize and prioritize their energy analysis based on their plant's specific processes and needs. The goal of the tool suite is to help industry save 0.4 quads of energy per year by 2010.

Objectives

This tool strategy sets forth five major objectives to achieve plant-wide energy savings in industry through the use of the ITP software tools:

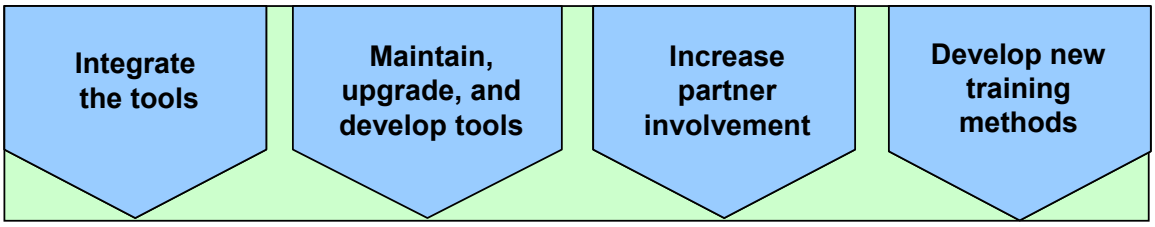
- *Increase Tool Awareness* among potential users in the manufacturing sector
- *Increase Tool Access* to make it easier for users to find and/or locate the tools
- *Increase Tool Use* by industrial end users
- *Increase Energy Awareness Plant-wide,* including awareness of energy use and savings opportunities
- *Promote Plant Investment* in energy efficiency projects

Tool Use Promotes Plant-wide Energy Savings



4. Strategic Pathways

To achieve the Tool Vision and Goals, ITP will continue to enhance the tool suite while fostering tool dissemination and use. Specifically, ITP will focus on four key strategic pathways:



1. *Integrate the tools* — Currently, the tools have different designs, platforms, and navigation capabilities. Existing and future tools should have a common look and feel. The tools should be packaged together so a user is aware of all the energy systems that currently have tools. Tool integration will make the tools easy to find and use, as well as facilitate the use of multiple tools by a single user to achieve energy savings throughout the plant.

2. *Maintain, upgrade, and develop tools* — Tool maintenance is needed to keep tools up-to-date with the latest technologies and electronic capabilities. Improving and expanding existing tools, as well as developing new tools, will reduce or eliminate gaps in areas covered by the tool suite and will help realize additional savings opportunities.

3. *Increase partner involvement* — Increased partner involvement will increase tool awareness among manufacturers, facilitate tool training opportunities, and increase participation in tool enhancement and dissemination.

4. *Develop new training methods* — New training methods are needed to maximize the number of industrial end users learning to use the tools. These methods will increase tool use by providing lower-cost access to tool training and by reducing the learning curve required for each tool.

These strategic pathways -– continuing to develop and enhance the tools, increasing collaboration with industry partners, and develop new flexible training methods – will help stimulate industry's use of the tools and lead to substantial improvements in overall energy efficiency. The challenges and key elements for each strategic pathway are described in the following pages.

Integrate the tools

Unify the look and feel of each tool and package them in an online tool suite to increase plant-wide awareness and use of the tools.

OBJECTIVE
⇒Increase Tool Awareness
⇒Increase Tool Access
⇒Increase Tool Use

Integrating the tools will make it easier for users to locate and use multiple tools. This will reduce the time required to learn and use each tool, and promote plant-wide energy savings. Tool use promotes awareness of energy use and helps to identify energy savings opportunities, which in turn, encourages plants to develop energy management plans.

CHALLENGES

The current portfolio of ITP software tools was developed through diverse, system-specific partnerships with industry. As a result, the ITP tools each have a different "look and feel," with particular variations in:

- program platform (excel or windows)
- opening screen design, colors, options, etc.
- capabilities (inputs, equipment databases, results, etc.)

These different designs and capabilities make it difficult for multiple tool users to learn and use each tool for plant-wide system analysis. In addition, each tool focuses on a specific system and does not provide a pathway for analyzing plant-wide energy savings opportunities.

Low awareness of energy use and savings opportunities

Low awareness of tools within industry

KEY MILESTONES

< 1 year

- Complete development of the Plant Energy Profiler (PEP) tool for the chemical industry. The PEP tool will help chemical plants identify and focus on their largest plant-wide energy savings opportunities.
- Conduct solicitation to choose a contractor to manage tool integration.

2005

1 – 3 years

- Develop a single, web-based, user-friendly interface for accessing and downloading the tools.
- Expand the PEP tool capabilities to include the other energy-intensive industries.
- Set design and capability standards to give the tools the same "look and feel."

2008

3 – 5 years

- Integrate the PEP tool's data entry with the individual system tools to eliminate duplication of data entry.
- Convert each tool into an internet-run program.

Maintain, upgrade, and develop tools

Update, enhance, and expand the tool suite to preserve its value over time and maximize industrial energy savings.

Regular maintenance will keep the tools up-to-date, and enhancements will enable them to provide more comprehensive results. New tools will allow plants to reduce energy losses in systems that have not yet been addressed. The combined impact will be a truly plant-wide approach to improving energy efficiency

OBJECTIVE
⇒Increase Energy Awareness Plant-wide

CHALLENGES

As new plant, software, and hardware technologies are developed and enter the market, tool content can become outdated. In addition, the tool scope and breadth of detail in each energy system varies considerably. Underdeveloped or outdated areas in the tools, as well as systems not covered by the tools, limit the tool suite's potential to help plants capture energy savings plant-wide.

Low awareness of energy use and savings opportunities

Tool gaps leave savings opportunities unaddressed

KEY MILESTONES

< 1 year	2005	1 – 3 years	2008	3 – 5 years
• Analyze current tools and select maintenance and upgrade tasks. • Analyze and prioritize opportunities to develop new tools. • Establish guidelines for tool development, testing, and implementation. • Develop action plans for each tool.		• Issue solicitation for tool development. • Initiate tool maintenance and upgrade activities.		• Complete maintenance, upgrade, and development activities. • Add modified and new tools to the integrated tool suite.

Increase Partner Involvement

Develop and foster existing partnerships with industry and organizations to increase industry energy awareness and tool use.

OBJECTIVE
⇒Increase Tool Awareness
⇒Promote Plant Investment
⇒Increase Energy Savings

Industry partners use the ITP software tools to save energy at their plants and help explain the benefits of the tools to others. Increasing collaboration with these and other partners will help ITP develop ways to increase plant/corporate awareness of energy savings benefits, which is needed to create a focus on energy management and raise the priority of energy projects.

CHALLENGES

Many plants are unaware of energy-efficiency opportunities and are unaware of the ITP energy system tools that are available to help them increase energy efficiency plant-wide. Even plants that are aware of energy-savings opportunities often do not know how to achieve these savings.

Tool users tend to be plant-level users who do not have the authority to dedicate resources to projects focused on energy savings. These users must convince plant management or even their corporate office to allocate money for energy-related projects. Due to limited plant budgets, relatively low energy costs, and competing corporate priorities, potential tool users struggle to get the funding or approvals necessary to dedicate time and/or resources to energy management.

- Low awareness of energy use and savings opportunities
- Limited plant budgets
- Competing corporate priorities
- Low awareness of tools within industry
- Plants lack people and time
- Tool users do not control budgets

KEY MILESTONES

< 1 year

- Identify and recruit additional tool partners to develop and disseminate the software tools. These and current ITP partners will be involved in the tool improvement and development process, beta testing, tool training, and other tool activities.
- Conduct a tool partner workshop to create an action plan for increasing industrial energy awareness.

2005

1 – 3 years

- Develop improved tool use tracking and results reporting methods.
- Develop a section in the Best Practices "Energy Matters" newsletter that features the tools and focuses on tool use, achievements, and savings methods.

2008

3 – 5 years

- Develop new methods for increasing awareness of tools and energy management in general.

Develop New Training Methods

Develop new methods to train tool users to maximize tool effectiveness and minimize the time required to learn each tool.

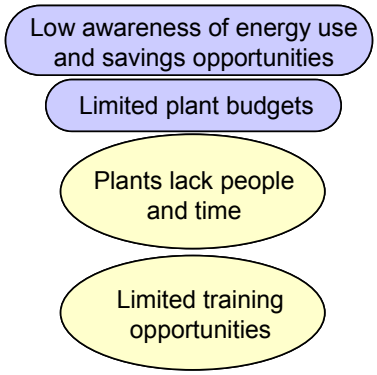
New training methods will allow plants to minimize the time spent learning how to use the tools. This will reduce the learning curve and promote actual tool use. Methods such as distance learning will also encourage more plant personnel to learn how to use the tools, because this can be accomplished without leaving the plant.

OBJECTIVE
Increase Tool Use

CHALLENGES

The software tools are complex and require user training to maximize tool effectiveness. Current training opportunities include energy system end-user training and qualified specialist training courses (qualified specialists also train users on how to use the tools). Approximately 225,000 industrial plants operate in the United States, most of which are not using the tools. DOE's training resources are limited, yet increased tool use through new training methods could realize significant gains in industrial energy efficiency.

Industry is faced with tight budgets, limiting the availability of personnel to attend training classes.



KEY MILESTONES

< 1 year (2005) **1 – 3 years** (2008) **3 – 5 years**

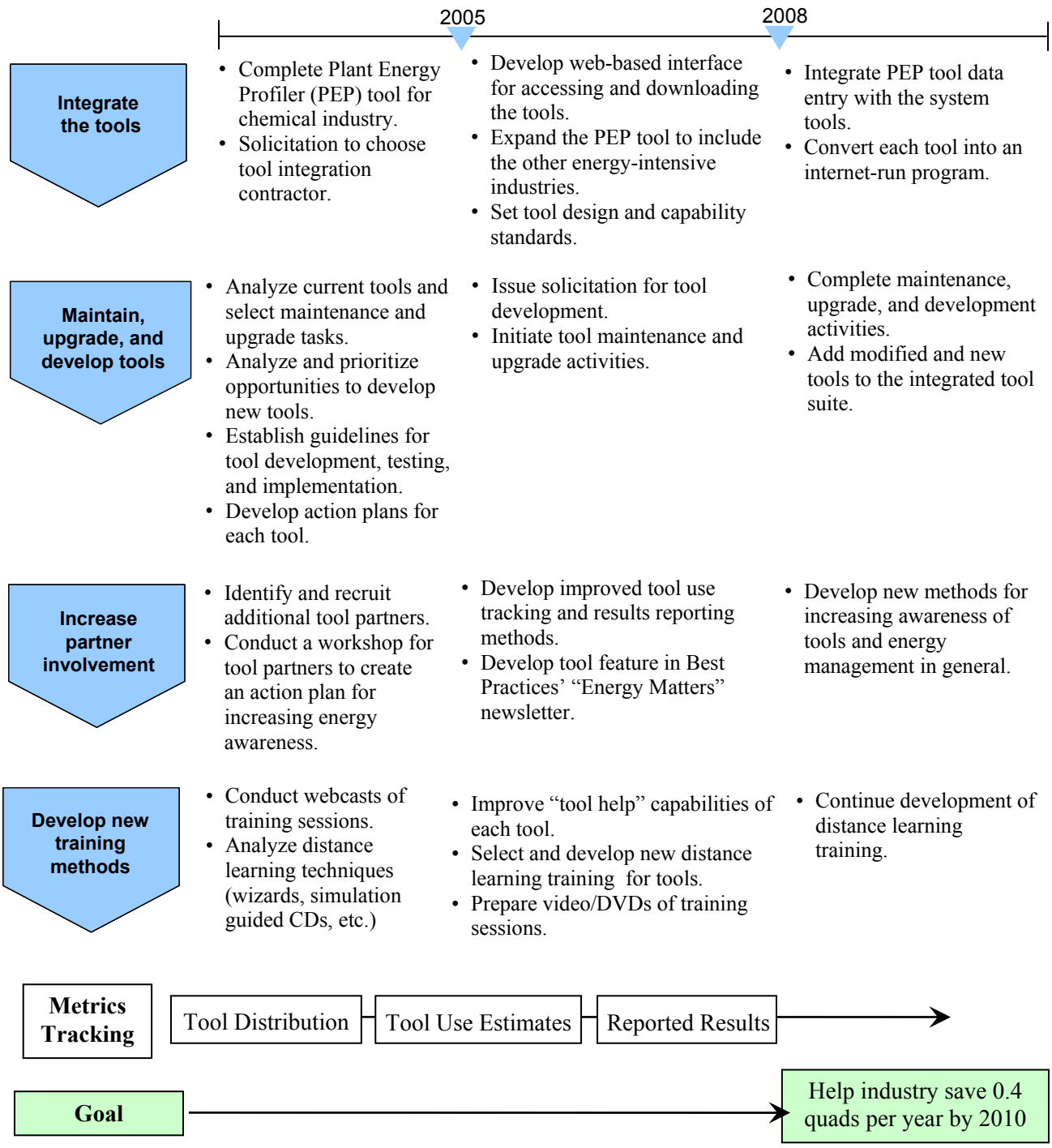
- Conduct webcasts of training sessions to allow more people to participate in training sessions.
- Analyze distance learning techniques (wizards, simulation-guided CDs, etc.) to supplement and replace current tool training.

- Improve the "tool help" capabilities of each tool.
- Select and develop new distance learning training for each tool.
- Prepare video/DVDs of training sessions.

- Continue development of distance learning training.

5. Implementation

Summary of Key Milestones



Metrics

ITP will continue to track the success and progress of the tools using three types of metrics:

- *Tool Distribution* metrics include the number of people who download the tools each year, the number of tools that were distributed by partners, the number of tools that were distributed at events sponsored by ITP programs, and the number of tool orders the EERE Information Center has filled.
- *Tool Use Estimates* use training class attendee counts, tool update downloads and orders, tool distribution counts, and tool registration to develop estimates for tool use and impact.
- *Reported Results* metrics include energy savings numbers, cost reduction, and emailed responses that indicate tool use.

ITP is currently tracking tool distribution and tool use estimates; these metrics will be used to determine baseline performance prior to the implementation of the Tool Strategy. The metrics for reporting results are difficult to collect due to the competitive nature of industry. Industrial companies in the manufacturing sector are reluctant to share information that relates to their energy use and cost. The strategic pathway to increase partner involvement will rely on industry partners to better understand these concerns and develop methods to track results that tool users will be willing to provide and that ITP can use.